

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Title: COOLING ARRAY

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TRANSMITTAL OF SUBSTITUTE SPECIFICATION

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Dear Sir:

Applicants have enclosed a Substitute Specification attached to a red ink marked-up copy of the verified English language translation of PCT International Application PCT/EP03/00212. The red ink identifies changes to the verified English language translation which are incorporated in the Substitute Specification.

The Substitute Specification includes general revisions to correct idiomatic translational errors and to provide proper headings. The undersigned states that the Substitute Specification contains no new matter.

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Applicants sincerely believe that this Patent Application is now in condition for prosecution before the U.S. Patent and Trademark Office.

Respectfully submitted,



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New Specification Section

(replaces pages 1 to 3 of the original specification)

BACKGROUND OF THE INVENTION
Field of the Invention

^{This}
 (The) invention relates to a cooling array with a housing receiving built-in electrical components and with an air conditioning arrangement, which is connected with a heat source of the built-in electrical components via a coolant-conducting inflow line and an outflow line, ^{wherein} [that] several component inlet lines branch off the inflow line and several component outflow lines branch off the outflow line, ^{wherein} at least one component inlet line and at least one component outflow line is assigned to a built-in electrical component, ^{and} ^{wherein} an inlet line and a return flow line branch off the air conditioning arrangement and are connected to the inflow line and the outflow line.

A cooling arrangement ^{Discussion of Related Art} [of this type] is ^{taught by U.S. Patent} known from USP 4,514,746. With this known structure the individual lines, which the connection with the air conditioning device and the consumers,

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for example
[i.e.] the built-in electrical components which are to be cooled, represent a complete system which is designed for a clearly defined number of built-in components. It is [therefore] ^{thus} not possible to change the structure of the cooling arrangement in a simple manner and to reduce and/or increase the number of built-in components.

For obtaining a flexible cooling arrangement, ^{according to this} the invention [provides that] the connectors are [constituted] ^{formed} by coupling devices, and [that] the coupling connections are embodied as couplings which can be separated or joined in a dripless manner [that the] ^{The} inflow lines and/or the outflow line ^{each} is embodied as ^a rigid profiled ^{leg} [legs] and [constitute] ^{forms} a guide channel for the coolant, for example water.

The built-in electrical components can be individually connected or disconnected by ^{the} [means of these] coupling devices, without not interfering with the remaining circulation of the other built-in components in the cooling arrangement. ^{Also} [Moreover], the inflow and/or outflow lines embodied as rigid profiled legs with guide phases for the coolant can easily be embedded in the switchgear cabinet and are available as connecting options for built-in electrical components over the entire height of the switchgear cabinet.

The inflow and the outflow lines are connected with an air conditioning arrangement, which can be an installation operating in accordance with ^{an} [the] evaporation principle.

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The component inlet and outflow lines have coupling elements at their ends, which can be joined with correspondingly designed counter-coupling elements to [constitute] *form* coupling connections.

[COOLING ARRAY]

[The invention relates to a cooling array with a housing receiving built-in electrical components and with an air conditioning arrangement, which is connected with a heat source of the built-in electrical components via a coolant-conducting inflow line and a return output.

Built-in electrical components, for example CPUs of computers, are specifically cooled by means of such cooling arrays. For this purpose, a cooling body, through which a liquid is passed, is placed on the respective heat source. The cooling body is connected to an air conditioning arrangement by means of an inflow and an outflow line.

These known solutions are mostly individual solutions which are only suitable in a limited way for commercial applications.]

above but — It is [the] ^{one} object of [the] ^{this} invention to [produce] ^{provide} a cooling array of the type mentioned [at the outset] which makes possible the air conditioning of complex systems with a multitude of built-in electrical components in a simple manner.

This object is [attained in that] ^{achieved by} several component inlet lines [branch] ^{branching} off the inflow line and several component outflow lines [branch] ^{branching} off the outflow line [and that at least one component inlet line and at least one component outflow line is assigned to a built-in electrical component.] ^{A+}

[It is possible by means of] ^{with} this cooling array ^{it is possible} to specifically remove large amounts of heat from a multitude of built-in electrical components. The collection of the removed amounts of heat [takes place here] in the outflow line. [In this case it] ^{I+} is possible to

[↑] occurs in

[↑] thus

individually connect the built-in electrical components to a component inlet line and a component outflow line. If several heat sources within a built-in component must be cooled, several component inlet lines and component outflow lines can also be connected. A large degree of flexibility is ^{thus} achieved ~~in this way~~.

The inflow line the outflow line are conducted to an air conditioning arrangement. The latter ^{that} can be ~~an arrangement~~ operating on the basis of ~~the~~ ^{an} evaporation principle. For reasons of space, the air conditioning arrangement is preferably arranged outside the housing. ^{and} It ~~exchanges~~ the heat energy removed from the housing with the surroundings. ^{Thus, one} ~~In this connection an~~ advantage of ~~the~~ ^{this} system ~~results in~~ ^{is} that it is possible to remove ^{relatively} ~~very~~ large amounts of heat from the housing. This allows the placement of components in the housing interior in a very compact form.

In accordance with ^{one} ~~a preferred~~ embodiment ^{of this invention,} ~~it is provided that~~ the component inlet and the component outflow lines have connecting elements at their ends, which can be joined together with corresponding counter-connecting elements to form coupling connections. Transfer points are made available to a user by ~~means of~~ this arrangement. ^{The user can thus} ~~By means of these he can~~ perform the connection of the cooling array with the respective built-in electrical component via the coupling connections.

^{In one embodiment,} ~~[A possible layout of~~ the cooling arrangement can be such that an inlet and a return flow line branch off the air conditioning arrangement and are connected to the inflow line and the outflow line, and ~~that~~ the connections are ~~constituted~~ ^{formed} by coupling connections. In that case the housing can be installed in the form of a system and can be connected simply and quickly with the air conditioning arrangement.

In order to prevent amounts of water which would endanger the built-in electrical components from flowing out ^{near or} in the area of the coupling connection during installation operations, ^{it} can be provided that the coupling connections are embodied as couplings which can be separated and joined without dripping. This type of a coupling connection also makes it possible to later ^{make a} change ⁱⁿ an operating cooling array. Accordingly, the built-in electrical components can also be connected or disconnected without problems, while the cooling array is operating.

^{In one} [A possible embodiment ^{variation} of ^{this} the invention, ^{can be distinguished in that} the housing is a switchgear cabinet, in whose rear area ^{forms} constitutes a receiving space for the vertically extending inflow line and outflow line.

For achieving problem-free ventilation with this arrangement, ^{it} can be provided that in the roof area of the housing the inflow line makes a transition into the outflow line via a connecting line, and ^{that} a ventilating device is integrated into the connecting line.

The available cooling output at a built-in electrical component can be varied in a simple manner if ^{it} is provided that the amount of coolant conducted to the built-in electrical components can be controlled by ^{means of} a governor integrated into the component inlet line or the component outflow line.

^{one embodiment of this} In accordance with a preferred variation of the invention, ^{it} can be provided that the inflow line and/or the outflow line are embodied as rigid profiled legs, which form a guide channel for the coolant, for example water. The profiled leg can be an extruded profiled section.

DESCRIPTION OF PREFERRED EMBODIMENTS

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In accordance with a preferred variation of the ^{one}embodiment, it can also be provided that the housing has a support frame with vertical profiled sections, and [that] the inflow line and/or the outflow line ^{each} is integrated into at least one profiled section.

[The] ^{This} invention [will be] ^{is} explained in greater detail [by means] of exemplary embodiments represented in the [drawings.] ^{BRIEF DESCRIPTION OF THE DRAWING} drawing that shows a ^{in view} schematic diagram of a cooling array.

The drawing shows a cooling array in a schematic representation. Here, a vertically extending inflow line 22 and an outflow line 26 are arranged in a housing 10. Built-in electrical components 11 ^{are} have also been placed inside the housing 10. They ^{and} contain heat sources which are to be cooled. Respectively, one component inlet line 23 branches off the inflow line 22, and respectively one component outflow line 27 off the outflow line 26. In this case the built-in electrical components 11, which are switched parallel with each other, are connected to the inflow line 22 or the outflow line 26. The connection of the built-in components 11 is provided by [means of] coupling connections 28, which can be joined and separated without dripping.

A governor 30 ^{is} [has been] integrated into the component outflow line for regulating the cooling output. It ^{and} regulates the amount of flow-through of coolant.

The inflow line 22 and the outflow line 26 are connected to an inlet line 20, or an outflow line 29 via coupling connections 21. They ^{and} lead to an air conditioning arrangement not ^{shown} [represented] in the drawing. The heat from the coolant [preferably water], is exchanged in ^{it}.

the air conditioning arrangement

For ^{providing} [being able to provide] ventilation of the system, a ventilating device 24 ^{is} [has] been ^{near or} installed in the area of a connecting line 25. The connecting line 25 is arranged in the ^{near or} area of the housing roof.